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FAIRCHILD SEMICONDUCTOR CORPORATION

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

ALPHA & OMEGA SEMICONDUCTOR,
INC., a California corporation; and
ALPHA & OMEGA SEMICONDUCTOR,
LTD., a Bermuda corporation,

Plaintiffs and Counterdefendants,

v.

FAIRCHILD SEMICONDUCTOR
CORP., a Delaware corporation,

Defendant and Counterclaimant.

AND RELATED COUNTERCLAIMS.

Case No. C 07-2638 JSW (EDL)
(Consolidated with Case No. C 07-2664 JSW)

**FAIRCHILD SEMICONDUCTOR
CORPORATION'S OPENING CLAIM
CONSTRUCTION BRIEF**

Date: June 4, 2008
Time: 2:00 p.m.
Courtroom: Hon. Jeffrey S. White

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I. INTRODUCTION

Fairchild Semiconductor Corporation ("Fairchild") is a leading global supplier of semiconductor devices used in the computing, communications, consumer, industrial, and automotive market segments. First established in 1957 in Palo Alto, California, before Silicon Valley got its name, Fairchild embarked on a course of leading-edge innovation, including the development of the planar silicon transistor and the integrated circuit.¹ Fairchild's innovation helped establish silicon as the most widely used base material for chip technology, and enabled mass production of complex devices. Regarded by many as the "Father of Silicon Valley," some of Fairchild's alumni went on to found such famous companies as Intel, AMD, National Semiconductor, LSI Logic, Altera and Xilinx.

Fairchild is asserting six patents against Alpha & Omega Semiconductor, Ltd., and Alpha & Omega Semiconductor, Inc., (collectively, "AOS"): U.S. Patents Nos. 6,429,481 ("the '481 patent"), 6,521,497 ("the '497 patent"), 6,710,406 ("the '406 patent"), 6,828,195 ("the '195 patent"), 7,148,111 ("the '111 patent"), and 6,818,947 ("the '947 patent").² The '497, '406, '195, and '111 patents (collectively, "the Fairchild Mo Patents") issued from applications that are related to an original application filed on November 14, 1997, that resulted in the '481 patent. The '947 patent issued from an unrelated application filed on September 19, 2002. Each of these patents is directed to semiconductor devices called power Metal Oxide Semiconductor Field Effect Transistors ("power MOSFETs").

As explained by Dr. Richard A. Blanchard³ in his accompanying declaration, power MOSFETs are essentially transistor switches fabricated on a semiconductor chip that can turn the flow of current on and off. Important parameters for power MOSFETs include their resistance to the flow

¹ After being sold to Schlumberger in 1979 and then to National Semiconductor in 1987, Fairchild became an independent company again in early 1997.

² AOS is asserting three patents against Fairchild: U.S. Patent Nos. 5,767,567, 5,907,776 and 5,930,630. This opening brief addresses the six disputed claim terms in Fairchild's patents. AOS will address in its own opening brief the four disputed claim terms in AOS's patents.

³ See Declaration of Dr. Richard A. Blanchard in Support of Fairchild's Opening Claim Construction Brief ("Blanchard Decl.").

of current in the on-state ("on-resistance"), their ability to withstand reverse voltage in the off-state ("breakdown voltage") and their switching speed. MOSFET devices are used in thousands of different products, from low voltage/low current power MOSFETs used in cell phones and personal computers to high voltage/high current power MOSFETs used in industrial applications such as ballasts for lighting. (Blanchard Decl., ¶¶ 11-21).

II. LEGAL STANDARD GOVERNING CLAIM CONSTRUCTION

A. The Role Of Claim Construction In A Patent Infringement Suit

Patent infringement analysis entails two steps. The first step is to determine the meaning and scope of the patent claims asserted to be infringed, and the second step involves comparing the properly construed claims to the accused infringing device or process. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996). Claim construction is determined as a matter of law. *Markman*, 517 U.S. 370, 372 (1996).

B. Claim Construction Methodology

1. Claim Terms Are Given Their Ordinary And Customary Meaning To One Of Ordinary Skill In The Art At The Time of Invention

Claim construction begins by inquiring into how a person of ordinary skill in the art would understand the claim term at the time of the invention - i.e., the effective filing date of the patent application.⁴ *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005). This inquiry is "based on the well-settled understanding that inventors are typically persons skilled in the field of the invention and that patents are addressed to and intended to be read by others of skill in the pertinent art." *Id.*, citing *Multiform Desiccants, Inc. v. Medzam, Inc.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998). Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent to a layperson (or the Court), "the court must examine the claims, the specification, the prosecution

⁴ In this case, a person of ordinary skill in the art would have either a Bachelor of Science degree in Electrical Engineering or Physics and three to five years of experience in semiconductor design or a Master of Science degree in Electrical Engineering or Physics and one to three years of experience in semiconductor design. (Blanchard Decl., ¶ 31).

1 history, and extrinsic evidence concerning the background of the technology, the meaning of technical
 2 terms and the state of the art to determine what a person of skill in the art would have understood the
 3 term to mean." *Phillips*, 415 F.3d at 1314 (citation omitted).

4 **2. The Claims Are Of Primary Importance In Claim Construction**

5 The claims themselves are of primary importance in claim construction. *Phillips*, 415 F.3d at
 6 1314, *citing VitronicsCorp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) ("The claims
 7 themselves provide substantial guidance as to the meaning of particular claim terms.") Courts
 8 accordingly should look at the context in which a claim term is used in the claim to determine its
 9 proper meaning. *Id.* Other claims of the patent, both asserted and unasserted, can also shed light on
 10 the meaning of a claim term. *Phillips*, 415 F.3d at 1314, *citing Vitronics*, 90 F.3d at 1582 ("Because
 11 claim terms usually are used consistently throughout a patent, the usage of a term in one claim can
 12 often illuminate the meaning of the same term in other claims.").

13 Differences among claims can also be helpful in understanding the meaning of particular claim
 14 terms. *Phillips*, 415 F.3d at 1314. Where different terms are used in different claims, it is presumed
 15 that the inventor meant something different in those claim terms. *Nystrom v. Trex Co., Inc.*, 424 F.3d
 16 1136, 1143 (Fed. Cir. 2006) ("When different words or phrases are used in separate claims, a
 17 difference in meaning is presumed.") Where a particular limitation is added in a dependent claim,
 18 there is a presumption that the limitation is not present in the independent claim. *Id.* at 1315, *citing*
 19 *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004).

20 **3. The Specification Is The Single Best Guide To Claim Construction**

21 The specification is of paramount importance in claim construction. For purposes of claim
 22 construction, the claims "do not stand alone," but rather are part of "a fully integrated written
 23 instrument." *Phillips*, 415 F.3d at 1315, *quoting Markman*, 52 F.3d at 978-79. The claims "must be
 24 read in view of the specification, of which they are a part." *Id.* The specification "is always highly
 25 relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the
 26 meaning of a disputed term." *Phillips*, 415 F.3d at 1315, *quoting Vitronics*, 90 F.3d at 1582. The
 27 "best source for understanding a technical term is the specification from which it arose, informed, as
 28 needed, by the prosecution history." *Phillips*, 415 F.3d at 1315, *quoting Multifarm Desiccants*, 133

1 F.3d at 1478.

2 A patentee's "lexicography," either explicit or implicit, controls the meaning of the claim term.
 3 *Phillips*, 415 F.3d at 1316 ("The specification may reveal a special definition given to a claim term by
 4 the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's
 5 lexicography governs."). Where the specification reveals an intentional disclaimer, or disavowal of
 6 claim scope by the inventor, that intention is dispositive. *Phillips*, 415 F.3d at 1316, *citing SciMed*
 7 *Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343-44 (Fed. Cir. 2001).

8 **4. Importation Of Limitations From The Specification Is Improper**

9 Importing limitations from the specification into the claims is improper. Although "the
 10 distinction between using the specification to interpret the meaning of a claim and importing
 11 limitations from the specification into the claim can be a difficult one to apply in practice," the line
 12 should be reasonably clear if the district court remains focused on how a person of ordinary skill in the
 13 art would understand the claim terms. *Phillips*, 415 F.3d at 1323. Reading the specification in context
 14 will usually inform the court whether the patentee is setting out specific examples of the invention or
 15 instead intends for the claims to cover only the embodiments described in the specification. *Id.*; *see*
 16 *also SciMed Life Sys.*, 242 F.3d at 1341. Where the specification describes specific embodiments, the
 17 claims should not be confined to those embodiments. *Phillips*, 415 F.3d at 1323; *see also Nazomi*
 18 *Communications, Inc. v. ARM Holdings, PLC*, 403 F.3d 1364, 1369 (Fed. Cir. 2005) (claims may
 19 embrace "different subject matter than is illustrated in the specific embodiments in the specification").

20 **5. The Prosecution History Can Inform The Meaning Of Claim Terms**

21 The prosecution history is part of the intrinsic record and can be helpful in claim construction.
 22 The prosecution history can "inform the meaning of the claim language by demonstrating how the
 23 inventor understood the invention and whether the inventor limited the invention in the course of
 24 prosecution, making the claim scope narrower than it would otherwise be." *Phillips*, 415 F.3d at 1317,
 25 *citing Vitronics*, 90 F.3d at 1582-83. The prosecution history, however, may be less useful than the
 26 specification because it represents an ongoing negotiation between the Patent Office and the applicant,
 27 and often lacks the clarity of the specification. *Phillips*, 415 F.3d at 1317.

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6. Extrinsic Evidence Must Be Considered In The Context Of Intrinsic Evidence

Extrinsic evidence is all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries and learned treatises. *Phillips*, 415 F.3d at 1317, *quoting Markman*, 52 F.3d at 980. Although extrinsic evidence "can shed useful light on the relevant art," it is "less significant than the intrinsic record in determining 'the legally operative meaning of claim language.'" *Phillips*, 415 F.3d at 1317 (citations omitted). Moreover, extrinsic evidence must be considered in the context of the intrinsic evidence. *Phillips*, 415 F.3d at 1319. Even a non-technical word describing patented technology should take "its definition from the context in which it was used by the inventor." *Tap Pharm. Products, Inc. v. Owl Pharm.*, 419 F.3d 1346, 1354 (Fed. Cir. 2005).

III. THE '481, '497, '406, '195 AND '111 PATENTS

A. Background Of The Technology

As will be explained in Fairchild's tutorial for the Court and as explained by Dr. Blanchard in his accompanying declaration, current in a power MOSFET flows between the "source" and the "drain." The current flow is controlled by the application of a voltage to a "gate." The gate can be formed parallel to the surface of the device, which is known as a "planar" design. The gate can also be formed in a trench etched into the chip, which is known as a "trench" design. (Blanchard Decl., ¶¶ 15-16). All of the Fairchild asserted patents relate to trench power MOSFETs. During the manufacturing process, various regions are formed in the silicon by adding "dopants" that are of positive conductivity type ("P-type") or negative conductivity type ("N-type"). P-type dopants are typically atoms of boron while N-type dopants are typically atoms of arsenic or phosphorus. A "lightly" doped region is one in which the added dopant is of low concentration, and is signified by "N- (N minus)" or "P- (P minus)." A "heavily" doped region has a high concentration of dopant, and is signified by "N+" or "P+." (Blanchard Decl., ¶ 13).

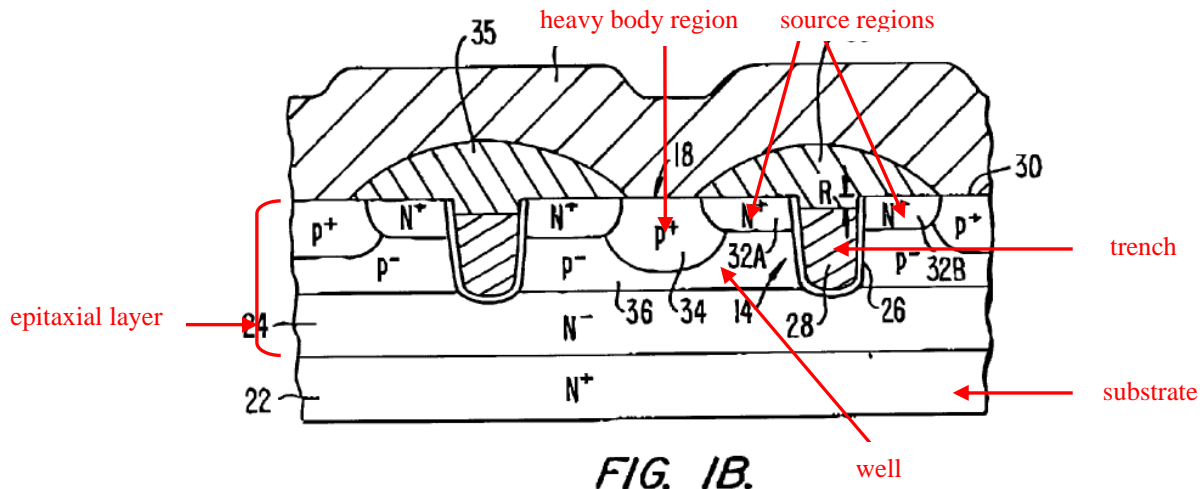
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A representative embodiment from the '481 patent is set forth below:



(Jacobs Decl., Ex. A ('481 patent), at Fig. 1B (annotated); Blanchard Decl., ¶ 22). The power MOSFET includes a silicon substrate, which serves as the drain of the device. A lightly doped epitaxial layer is formed on the substrate, into which trenches are etched. The trenches are filled with a conductive material (usually polysilicon) which form gate electrodes. Lightly doped “wells” that have a conductivity type opposite to that of the epitaxial region are formed between the trenches, and heavily doped “heavy body regions” are formed in the wells. Source regions of the same conductivity type as the epitaxial region are formed on each side of each trench, near the surface of the silicon.

A representative claim, claim 1 of the '481 patent, states:

A trenched field effect transistor comprising:

a semiconductor substrate having dopants of a first conductivity type;

a trench extending a predetermined depth into said semiconductor substrate;

a pair of doped source junctions having dopants of the first conductivity type, and positioned on opposite sides of the trench;

a doped well having dopants of a second conductivity type opposite to said first conductivity type, and formed into the substrate to a depth that is less than said predetermined depth of the trench; and

a doped heavy body having dopants of the second conductivity type, and positioned adjacent each source junction on the opposite side of the source junction from the trench, said heavy body extending into said doped well to a depth that is less than said depth of said doped well,

wherein the heavy body forms an abrupt junction with the well and the depth of the junction, relative to the depth of the well, is adjusted so that a transistor breakdown initiation point is spaced away from the trench in the semiconductor, when voltage is applied to the transistor.

(Jacobs Decl., Ex. A ('481 patent), at col. 8, lines 43-67 (emphasis added)). There are three claim construction disputes concerning the '481, '497, '406, '195, and '111 patents. Two of the disputes relate to the two phrases in bold in the representative claim above (and similar language in other claims). The third dispute relates solely to claim 29 of the '111 patent and, in particular, concerns the meaning of the phrase "resulting in avalanche current that is substantially uniformly distributed." The proper construction of each of these phrases is discussed below.

B. Claim Construction Analysis

1. "wherein the heavy body forms an abrupt junction with the well" and similar language ('481 patent, claims 1, 6, 15; '406 patent, claims 1, 13; '195 patent, claims 1, 21)

Fairchild's Proposed Construction	AOS's Proposed Construction
The transition between the heavy body and the well occurs over a short distance relative to the depth of the well.	<p>The doping concentration gradient at the junction between the heavy body and the well is sufficiently high that further increasing the doping concentration gradient does not further reduce the breakdown voltage at the p-n junction between the well and the substrate.</p> <p>A linearly graded junction is not an abrupt junction.</p> <p>AOS contends that this claim element is indefinite.</p>

The primary dispute concerning this term is the meaning of "abrupt junction." Fairchild contends that, in the context of the patents-in-suit, the term "abrupt junction" would have been understood by someone of ordinary skill to mean that the transition between the heavy body and the well occurs over a short distance relative to the depth of the well. The specification and file history confirm that this is the correct construction.

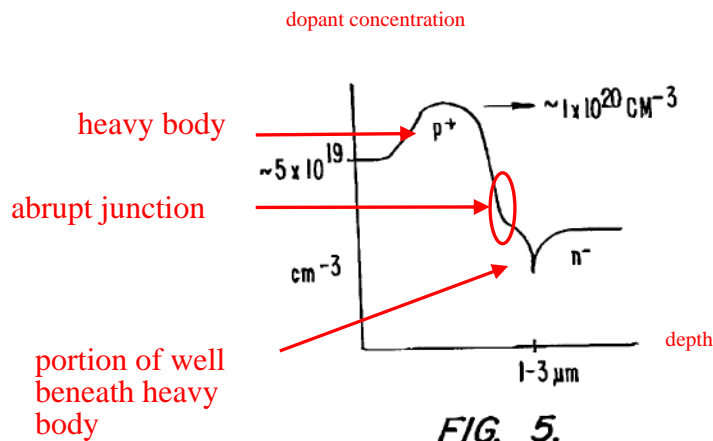
In the semiconductor arts, it is common to measure the concentration of dopants at given

depths from the surface of a chip. A graphical representation of this measurement is often referred to as a "doping profile." (Blanchard Decl., ¶ 35). During prosecution, the inventors amended the claims to include the "abrupt junction" limitation. In explaining what the term means, the inventors pointed to a drawing of the doping profile of the preferred embodiment that was submitted with the application (Figure 5 of the '481 patent), and noted that it showed the transition between the heavy body and the well "changes rapidly in a short further depth" to form the abrupt junction:

The unique concentration profile of the p+ heavy body with respect to the p-well is depicted graphically in Fig. 5. Notice that the peak p+ heavy body is at a predetermined depth in the p-well and *changes rapidly in a short further depth (i.e. has a steep doping concentration gradient) to form the abrupt transition with the p-well.*

(Jacobs Decl., Ex. G ('481 file history, Preliminary Amendment dated September 5, 2000), at p. 8). In other words, Fairchild explained to the USPTO that the transition between the heavy body and the well occurs over a short distance relative to the depth of the well.

The doping profile of Figure 5 shows the dopant concentration of the heavy body and the well on the vertical axis versus depth into the silicon on the horizontal axis. (Blanchard Decl., ¶ 35). It also shows a noticeable transition between these two regions where the slope of the line changes in a short distance.



(Jacobs Decl., Ex. A ('481 patent), Fig. 5 (annotated); Blanchard Decl., ¶ 35). As noted above, Fairchild defined this change in slope as an abrupt junction both in the Fairchild Mo Patents themselves and during prosecution.

AOS's proposed construction, in contrast, is without merit because it has *no* support from the

specification at all. Indeed, AOS does not contend otherwise. Moreover, it makes no sense in the context of the claimed invention. It requires that there be a single doping concentration gradient, and that the gradient be sufficiently high so that a specific result is achieved. This construction is flawed because, contrary to AOS's urging, there is no single dopant concentration gradient **at** the abrupt junction. Instead, there are many. (Blanchard Decl., ¶ 38). Additionally, AOS's use of the language "sufficiently high" creates ambiguity rather than clarity. Accordingly, it makes no sense to refer to a single gradient when referring to the junction between the heavy body and the well. (*Id.*)

AOS's proposed construction is also flawed because there is no support in the specifications or file histories for the requirement that "further increasing the doping concentration gradient does not further reduce the breakdown voltage at the p-n junction between the well and the substrate." There is no support that the claim requires an absolute minimum breakdown voltage at this location.

AOS's position is also undercut by the fact that AOS has fundamentally changed its proposed construction since the beginning of the claim construction process in this case. Below is a comparison of AOS's two different positions concerning the construction of this term.

AOS's Initial Proposed Construction	AOS's Present Proposed Construction
The doping concentration gradient at the junction between the heavy body and the well is sufficiently high that the breakdown voltage at the p-n junction between the well and the substrate cannot be reduced any further by increasing the doping concentration gradient.	The doping concentration gradient at the junction between the heavy body and the well is sufficiently high that <i>further increasing the doping concentration gradient does not further reduce the breakdown voltage at the p-n junction between the well and the substrate.</i>
	<i>A linearly graded junction is not an abrupt junction.</i>
	<i>AOS contends that this claim element is indefinite.</i>

(Jacobs Decl., Ex. H (AOS's Proposed Claim Constructions dated January 9, 2008), at p. 3; Jacobs Decl., Ex. I (Joint Claim Construction and Pre-Hearing Statement), at Exh. B, p. 2). The last-minute changes in AOS's proposed construction are in bold. The first significant change is that, in contrast to its original position, AOS now seeks to construe "abrupt junction" by asserting what is ***not*** covered by

the term. In particular, AOS now contends that a "linearly graded" junction is not an abrupt junction. This adds no clarity at all to the meaning of "abrupt junction," instead raising the issue of what is a "linearly graded junction." The other significant change is that AOS for the first time contends that "abrupt junction" is indefinite. This argument is meritless and, in any event, AOS waived it because AOS failed to assert this within the deadlines imposed by the Patent Local Rules. Indeed, AOS did not disclose this argument in its invalidity contentions, in its discovery responses, or at any other time prior to the filing of the joint claim construction statement.

2. "resulting in avalanche current that is substantially uniformly distributed" ('111 patent, claim 29)

Fairchild's Proposed Construction	AOS's Proposed Construction
Resulting in avalanche current that is approximately evenly distributed across the active region of the device.	The avalanche current at breakdown initiation is roughly equally distributed across the entire device.

This term is present only in claim 29 of the '111 patent. There are two disputes concerning this term. The first dispute is whether the uniformity of the "avalanche current" must be measured across the active region of the device or across the entire device. The second dispute concerns AOS's requirement that the current distribution must be measured "at breakdown initiation."

As for the first dispute, a person of ordinary skill in the art would understand that the uniformity of the avalanche current should be measured in the *active* region of the device, not across the entire device. (Blanchard Decl., ¶¶ 40-45). Power MOSFETs include two generally distinct regions when viewed from above the device: an "active region" where transistors are formed and a "termination region" located in the device periphery which surrounds the active region. The claim at issue here relates only to the active region, which is the area where the cell array is present and includes the trenches, doped wells, heavy body regions, source regions, and other structures which form the transistors of the claimed invention. (Blanchard Decl., ¶ 41). Figure 1B of the '111 patent illustrates a cross-section of the relevant part of the active area:

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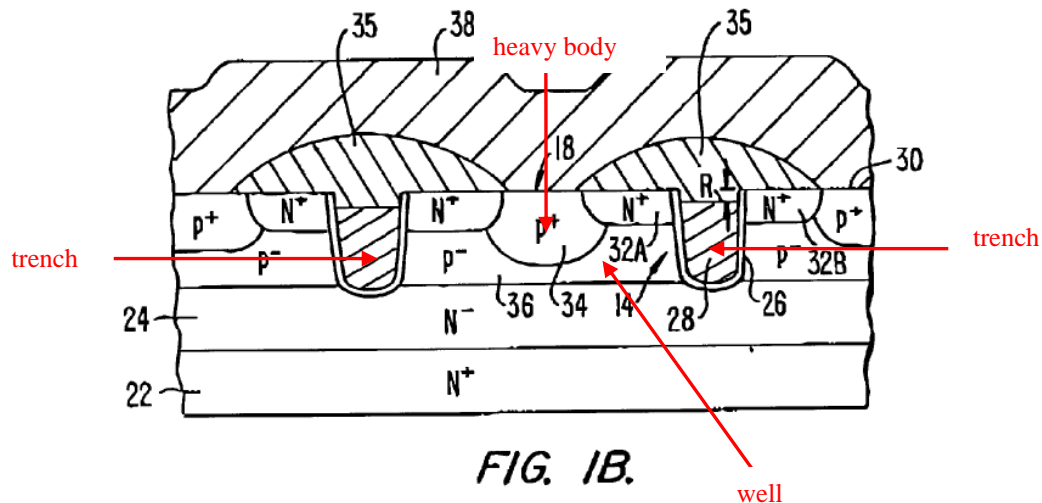


FIG. 1B.

(Jacobs Decl., Ex. F ('111 patent), at Fig. 1B (annotated).) The figure shows a transistor cell including a pair of trenches, a doped well formed between the trenches, and a heavy body region formed in the doped well. The active region of a power MOSFET typically contains many thousands of such cells. (Blanchard Decl., ¶ 41). Claim 29 of the '111 patent is directed to the active region and includes the step of "adjusting the dopant profile" of the heavy body regions so that the peak electric field is directed to a specific location – "away from a nearby trench toward the heavy body." (Jacobs Decl., Ex. F ('111 patent), at col. 11, lines 7-10). In other words, the claim requires that the peak electric field be located between the trenches in the active region and toward the heavy body as a means of controlling avalanche current in the active region. Such current initially forms at the location of the peak electric field and then spreads across the active region. (Blanchard Decl., ¶ 43). Because the claim language states that the peak electric field is "toward the heavy body," which is part of the active region, a person of ordinary skill in the art would therefore understand that the uniformity of the "avalanche current" is measured only in the active region. (*Id.*)

Concerning the second dispute, AOS has completely manufactured the requirement that the uniformity of avalanche current distribution be measured "at breakdown initiation." The claim language provides that the resulting avalanche current must be "substantially uniformly distributed." It does not, however, require that this distribution be present at a specific moment in time during the avalanche process, much less at breakdown initiation. (Blanchard Decl., ¶ 45). A person of ordinary skill in the art would understand that avalanche breakdown typically begins at a single point in the active region and then rapidly spreads through the active region. (*Id.*) For this reason, a person of

ordinary skill in the art would find AOS's requirement that avalanche current be equally distributed over the entire device when the breakdown initiates to be illogical. (*Id.*) Accordingly, AOS's construction should be rejected.

3. "depth of the junction, relative to the depth of the well, is adjusted so that a transistor breakdown initiation point is spaced away from the trench in the semiconductor when voltage is applied to the transistor" and similar language ('481 patent, claims 1, 6, 15; '406 patent, claims 1, 13)

Fairchild's Proposed Construction	AOS's Proposed Construction
Fairchild does not believe construction of this term is required. The ordinary meaning should apply.	Selecting by repeated experiments or by computer simulation the relative depths of the well and the junction for the purpose of moving initiation of breakdown in the device toward the center of the body region between adjacent trenches.

This straightforward term is found in the '481 and '406 patents and needs no construction. The language unambiguously provides that the depth of the abruption junction is adjusted relative to the depth of the well so that a transistor breakdown initiation point is "spaced away from the trench" in the semiconductor when voltage is applied to the transistor. A person of ordinary skill in the art would understand that the ordinary meaning of this language should apply, including the meaning of "adjusted" and "spaced away," and thus construction by the Court is unnecessary. (Blanchard Decl., ¶¶ 46-48).

The specification illustrates the straightforward meaning of this claim language.

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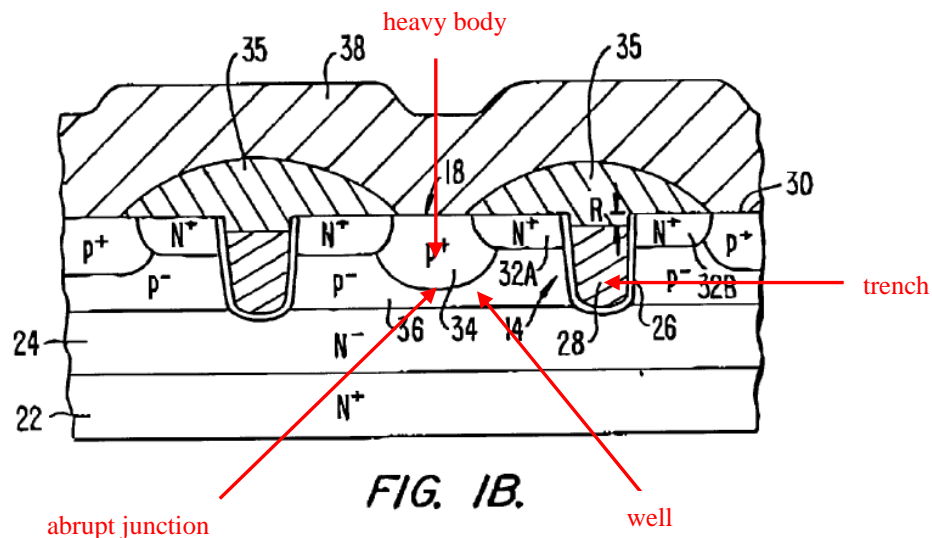
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(Jacobs Decl., Ex. A ('481 patent), at Fig. 1B (annotated)). The figure above shows an embodiment of the claimed invention including a heavy body, well, abrupt junction, and trench. The heavy body forms an abrupt junction with the well, and the depth of the well is greater than the depth of the abrupt junction. The claim language requires that the depth of the abrupt junction be "adjusted" such that the breakdown of the transistor occurs at a location "spaced away" from the trench. In other words, the claim requires that the transistor breakdown not occur at the trench.

The specification and file history support this ordinary meaning construction. The specification describes two possible locations for the location of breakdown initiation. First, it explains that it must be spaced away from the trench and not located at the trench.⁵ (Jacobs Decl., Ex. A ('481 patent), at col. 2, lines 29-32). (Blanchard Decl., ¶ 47). Second, the specification explains that the transistor breakdown may preferably be located at a central location between adjacent trenches. (Jacobs Decl., Ex. A ('481 patent), at col. 5, lines 8-12). The first location is plainly broader than the second, in that the transistor breakdown can be "spaced away" from the trench without being at a central location between adjacent trenches. (Blanchard Decl., ¶ 48). The ordinary meaning of the claim language plainly covers the first location described in the specification. (*Id.*). An important aspect of the invention is to avoid breakdown at the trench where it can cause irreversible damage to

⁵ The initiation of transistor breakdown occurs at the location of the peak electric field.

1 the sensitive gate oxide. This aspect is reflected by specifying that the location of breakdown is
2 spaced away from the trench.

3 As for the meaning of "adjusted," the file history confirms that the ordinary meaning should
4 apply. Each usage of the term in the file history is consistent with its ordinary meaning. When the
5 inventors added the term "adjusted" to the claim language, they made clear that the claimed invention
6 relates to a structure in which the relative depths of the heavy body and well are "adjusted." (Jacobs
7 Decl., Ex. J ('481 file history, Amendment dated June 7, 2001), at p. 9). Similarly, when the inventors
8 subsequently distinguished the claimed invention from a cited reference, they once again used the
9 term in a manner consistent with its ordinary meaning. (Jacobs Decl., Ex. K ('481 file history,
10 Amendment dated December 31, 2001), at p. 6 ("[The cited reference] Hsieh '543 expressly teaches
11 to use a 'buried layer 16' to relocate the breakdown initiation point (col. 3, lines 3-5), and does not do
12 so by *adjusting* the relative depths of the P+ and the well regions.") (emphasis added)). In making
13 this statement, Fairchild did not assert or suggest that "adjusted" had a special meaning. The ordinary
14 meaning therefore should be used in interpreting this claim language.

15 AOS's unsupported construction should be rejected for at least three reasons. First, AOS's
16 construction is wrong because it replaces the simple word "adjusted" with a wholly fabricated phrase
17 "selecting by repeated experiments or by computer simulation." Of course, "selecting" is no more
18 clear than "adjusted." Moreover, AOS's construction improperly includes a requirement about *how*
19 the "selecting" *must* take place. Under AOS's construction, the selecting may only occur by repeated
20 experiments or by computer simulations. No other means of "selecting" is permitted.
21 Understandably, AOS provides no support in the intrinsic record for importing such a limitation
22 because there is none. (Blanchard Decl., ¶ 48).

23 Second, AOS's construction improperly requires that the relative depths be selected with a
24 specific intent. In particular, AOS asserts that the claim requires the relative depths be selected "*for*
25 *the purpose* of moving initiation of breakdown in the device." There is no support for this added
26 limitation. The claim language, of course, has no intent requirement, but rather simply requires that
27 the relative depths be adjusted and a specific result is achieved -- the transistor breakdown initiation
28 point is spaced away from the trench. (Blanchard Decl., ¶ 48). It is the resulting structure that

1 matters, **not** the intent. For example, an infringer might adjust the depth of the abrupt junction for a
 2 purported reason unrelated to breakdown but still obtain the benefit of the claimed invention. In fact,
 3 the Federal Circuit has held that there is no intent requirement for direct infringement. *See, e.g., Dow*
 4 *Chemical Co. v. Mee Industries, Inc.*, 341 F.3d 1370, 1380 (Fed. Cir. 2003) (holding that "the motive
 5 of the accused infringer when performing the claimed method is simply not relevant"). Consequently,
 6 AOS's attempt to import one into the claim language should be rejected.

7 In fact, AOS's requirement that the claim term requires some sort of intent is belied by the fact
 8 that it is inconsistent with its own prior construction. Below is a comparison of AOS's initial and
 9 present positions:

AOS's Initial Proposed Construction	AOS's Present Proposed Construction
Selecting by repeated experiments or by computer simulation the relative depths of the well and the junction and the doping concentration gradient between the heavy body and the well so that the peak electric field is moved toward the centers of the cells, which are approximately halfway between adjacent trenches.	Selecting by repeated experiments or by computer simulation the relative depths of the well and the junction for the purpose of moving initiation of breakdown in the device toward the center of the body region between adjacent trenches.

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 11
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 17 (Jacobs Decl., Ex. H (AOS's Proposed Claim Constructions dated January 9, 2008), at pp. 3-4;
 18 Jacobs Decl., Ex. I (Joint Claim Construction Statement), at Exh. B, pp. 5-6). It is readily apparent
 19 that AOS initially believed that the claim term did not require any specific intent that the adjustment
 20 of the depth of the abrupt junction be made for the purpose of moving the breakdown initiation point.

21 Third, AOS's construction incorrectly replaces "spaced away from the trench" with "toward the
 22 center of the body region between adjacent trenches." Once again, AOS seeks to rewrite the claim in
 23 an effort to narrow its scope. The claim language plainly requires the transistor breakdown point to be
 24 simply spaced **away** from the trench. Yet AOS proposes that the language be construed to require it to
 25 be located toward a specific location -- **toward** the center of the body region between trenches. The
 26 proper meaning of the claim language is broader than AOS's interpretation, as the transistor
 27 breakdown point may be "spaced away" from the trench even when it is not toward the center of the
 28 body region. (Blanchard Decl., ¶ 48).

1 The doctrine of claim differentiation also demonstrates that AOS's proposed construction is meritless.
 2 This doctrine creates "a presumption that each claim in a patent has a different scope." *Comark*
 3 *Communications, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998). Under the doctrine, a
 4 claim construction that results in one claim having the same scope as another is "presumptively
 5 unreasonable." *Beachcomber v. Wildewood Creative Products, Inc.*, 31 F.3d 1154, 1162 (Fed. Cir.
 6 1994). The doctrine "is clearly applicable when there is a dispute over whether a limitation found in a
 7 dependent claim should be read into an independent claim, and that limitation is the only meaningful
 8 difference between the two claims." *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225,
 9 1233 (Fed. Cir. 2001); *see also Dow Chem. Co. v. United States*, 226 F.3d 1334, 1341-42 (Fed. Cir.
 10 2000) (applying the doctrine of claim differentiation and concluding that an independent claim should
 11 be given broader scope than a dependent claim to avoid rendering the dependent claim redundant).

12 Here, if AOS's construction were adopted, there would be virtually no difference between
 13 certain independent and dependent claims. Claim 13 of the '406 patent, for example, includes the
 14 "spaced away" language: wherein the heavy body forms an abrupt junction with the well, and the
 15 depth of the heavy body relative to a depth of the well is adjusted so that ***breakdown of the transistor***
 16 ***originates in the semiconductor in a region spaced away from the trenches when voltage is applied***
 17 ***to the transistor***. (Jacobs Decl., Ex. C ('406 patent), at col. 9, lines 56-62). Claim 15, however,
 18 depends from claim 13 and provides that the "adjusted depth of the junction causes the breakdown
 19 origination point ***to occur approximately halfway between adjacent trench gate-forming trenches***."
 20 (*Id.* at col. 9, line 65 - col. 10, line 2). If AOS's proposed construction of "spaced away" were
 21 adopted, claim 13 would not be broader than claim 15, because a breakdown initiation point located
 22 "approximately halfway between adjacent gate-forming trenches" (as required by claim 15) would
 23 also be "toward the center of the body region between adjacent trenches" (AOS's construction of claim
 24 13). In other words, if AOS's construction were adopted, claim 15 would not be narrower in scope
 25 than claim 13, in violation of the claim differentiation doctrine. Accordingly, AOS's proposed
 26 construction is incorrect, and the ordinary meaning proposed by Fairchild should apply.

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1 IV. THE '947 PATENT

2 A. Background Of The Technology

3 The '947 patent, like the Fairchild Mo Patents, is directed to trench power MOSFETS. (Jacobs
4 Decl., Ex. D ('947 patent), at col. 1, lines 12-17; col. 2, lines 3-4; col. 3, lines 9-23; Blanchard Decl., ¶
5 25). It combines two structural features in a novel way to overcome performance limitations of prior
6 art designs. Specifically, the '947 patent combines a "gate runner" with a "field plate" in the
7 termination region. (Jacobs Decl., Ex. D ('947 patent), at col. 2, lines 37-48; col. 4, lines 33-46; col.
8 5, lines 35-45; Blanchard Decl., ¶ 30).

9 As explained in the '947 patent specification, as well as Dr. Blanchard's declaration, gate
10 runners are used in power semiconductor devices to improve the switching speed of the device and to
11 decrease the amount of voltage that must be applied to the gate to turn the device on. (Jacobs Decl.,
12 Ex. D ('947 patent), at col. 1, lines 12-24; col. 2, lines 37-42; Blanchard Decl., ¶¶ 27, 30). Absent
13 gate runners, the resistance in the polysilicon gate structure of the transistor introduces a delay from
14 the time at which voltage is applied to the gate pad located in the corner of the die and the time that
15 voltage is realized throughout the device. (Blanchard Decl., ¶ 27). This delay has a negative affect on
16 performance. (*Id.*).

17 Field plates are one of several structures that can be used to increase breakdown voltage in the
18 termination region. (Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 25-67; Blanchard Decl., ¶ 29).
19 It is important in a power MOSFET that if the device goes into breakdown, it should occur in the
20 active region and not in the termination region. (Blanchard Decl., ¶ 44). This is because the
21 termination region is relatively small by comparison and can handle only a small amount of avalanche
22 current, whereas the active area is much larger and can handle greater avalanche current flow. (*Id.*).
23 Therefore, the breakdown voltage in the termination region must be higher than in the active region.
24 (Blanchard Decl., ¶ 44). Field plates are one type of structure that can increase breakdown voltage in
25 the termination region. Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 25-67; Blanchard Decl., ¶
26 29). Alternative structures recited in the background section of the patent include "field rings" and
27 "channel stops." Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 25-67; Blanchard Decl., ¶ 29).

28 One of the problems associated with providing structures such as gate runners and field plates

in the termination region is that these structures take up valuable surface area. (Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 39-49; Blanchard Decl., ¶ 29). This is a drawback because it is preferable for the active area to be as large as possible. (Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 39-49; Blanchard Decl., ¶ 29). For a given die size, the larger the termination structure, the smaller the active area. (Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 39-49; Blanchard Decl., ¶ 29). Prior art techniques of utilizing separate gate runners and field plates resulted in relatively large termination structures. (Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 39-49; Blanchard Decl., ¶ 29). The patentees, however, realized that the physical parameters of a gate runner could be modified so that it could also operate as a field plate. This is the invention that is claimed in the '947 patent. (Jacobs Decl., Ex. D ('947 patent), at col. 2, lines 37-48; col. 4, lines 33-46; col. 5, lines 35-45; Blanchard Decl., ¶ 30).

B. Claim Construction Analysis

1. "acting as a field plate to extend the device breakdown voltage in the breakdown region" ('497 patent, claim 1);

"acts as a field plate termination" ('497 patent, claim 5);

"forming a field plate around the transistor regions" ('497 patent, claim 6).

Fairchild's Proposed Construction	AOS's Proposed Construction
acting as a conductive structure at or near the top surface of the substrate to increase breakdown voltage in the termination region	a conductive ring formed in a trench in the termination region, resulting in a higher breakdown voltage in the termination region by modifying the depletion layer in the underlying silicon
forming a conductive structure at or near the top surface of the substrate that increases breakdown voltage in the termination region	

Fairchild proposes that these claim limitations be construed as "acting as a conductive structure at or near the top surface of the substrate to increase breakdown voltage in the termination region" and "forming a conductive structure at or near the top surface of the substrate that increases breakdown voltage in the termination region." Fairchild's proposed constructions are consistent with the

1 disclosure of the '947 patent, as well as the understanding of a person of ordinary skill in the art.

2 Claim 1 recites a "single conductor" having a "first conductor portion" and a "second
3 conductor portion," and states that the second conductor portion must act as a field plate. Similarly,
4 claim 5 recites "first and second conductor regions," and states that the second conductor region acts
5 as a field plate. Claim 6 recites a "trench" having an "outer annular portion" filled with a conductive
6 material, forming a field plate. The second conductor portion of claim 1, the second conductor region
7 of claim 5, and the field plate of claim 6, all refer to "conductive material 64" and "contact 68"
8 described in the '947 patent specification and shown in Figure 1. (Jacobs Decl., Ex. D ('947 patent),
9 at col. 4, lines 2-9; col. 4, lines 15-23; col. 4, lines 33-46; col. 5, lines 15-23; Fig. 1). Conductive
10 material 64 and contact 68 are located at or near the top surface of the substrate, as is reflected in
11 Fairchild's proposed construction. (Jacobs Decl., Ex. D ('947 patent), at col. 4, lines 2-9; col. 4, lines
12 15-23; col. 4, lines 33-46; col. 5, lines 15-23; Fig. 1).

13 The '947 patent states that the purpose of a field plate is to increase breakdown voltage in the
14 periphery of the device. The '947 patent states in the background section that it is desirable to increase
15 current density in a power semiconductor device. (*Id.*, at col. 1, lines 27-29). The background section
16 then states that "[o]ne of the limiting factors to higher current ratings is the breakdown voltage,
17 particularly in the edge termination region." (*Id.*, at col. 1, lines 29-31). The patent lists field rings,
18 channel stops, and field plates as specific prior art techniques for addressing the issue of breakdown
19 voltage in the termination region. (*Id.*, at col. 1, lines 34-39). The background section also lists
20 several examples of prior art that describe edge termination designs to address breakdown voltage
21 phenomena. (*Id.*, at col. 1, lines 43-61). Thus, the background section makes clear that the problem
22 being addressed by the patent is the need to increase the breakdown voltage in the termination region
23 of a semiconductor device.

24 The summary section of the '947 patent states that the invention includes a "trenched field
25 plate positioned about the transistor region for increasing breakdown voltage." (*Id.*, at col. 2, lines 37-
26 40). The description of the invention in the '947 patent states that "the invention enables a higher
27 breakdown voltage at the die edge with a reduced number of process steps ..." and that "[t]he design
28 principles may be readily applied to prevent breakdown voltages well in excess of 200 volts." (*Id.*, at

1 col. 5, lines 55-63). Finally, the language of claim 1 itself states that the field plate serves to "extend
2 the device breakdown voltage in the termination region." (*Id.*, at col. 6, lines 30-36). Thus, the '947
3 patent makes clear that the function of the claimed field plate is to increase breakdown voltage in the
4 termination region. This function of a field plate is properly stated in Fairchild's proposed
5 construction.

6 AOS proposes that this claim language be construed as "a conductive ring formed in a trench
7 in the termination region, resulting in a higher breakdown voltage in the termination region by
8 modifying the depletion layer in the underlying silicon." AOS's proposed construction is wrong for
9 several reasons. While properly stating that the claimed field plate increases breakdown voltage in the
10 termination region, it improperly requires that the field plate accomplish this end by "modifying the
11 depletion layer in the underlying silicon." This language is unnecessary and has no support in the
12 intrinsic evidence. The '947 patent specification never mentions the phrase "depletion region," or even
13 the term "depletion." Thus, AOS's proposed construction reads in limitations that are not even
14 disclosed in the '947 patent specification.

15 The phrase "depletion region" does appear in the textbook "Modern Power Devices" by B.
16 Jayant Baliga ("the Baliga Text"), which is incorporated by reference in the '947 patent. (Jacobs
17 Decl., Ex. D ('947 patent), at col. 1, lines 48-52; Jacobs Decl., Ex. L (Baliga Text), at pp. 116-119).
18 The Baliga Text, however, was cited in the '947 patent as providing a background description of a
19 prior art edge termination design. (Jacobs Decl., Ex. D ('947 patent), at col. 1, lines 48-52; Blanchard
20 Decl., ¶ 52). It was not cited as describing the operation of the claimed field plate. (Jacobs Decl., Ex.
21 D ('947 Patent), at col. 1, lines 48-52; Blanchard Decl., ¶ 52). In fact, the Baliga Text describes only
22 planar field plates. (Jacobs Decl., Ex. L (Baliga Text), at pp. 116-119; Blanchard Decl., ¶ 52). It does
23 not describe field plates that are located at least partially within a trench, such as the field plate that is
24 claimed in the '947 Patent. (Jacobs Decl., Ex. L (Baliga Text), at pp. 116-119; Blanchard Decl., ¶ 52).
25 The description of field plates in the Baliga Text does not directly apply to trenched field plates
26 because the orientation of the constant voltage of a planar field plate is different than of a trenched
27 plate. (Blanchard Decl., ¶ 52). Consequently, AOS's implicit assertion that the Baliga Text describes
28 the operation of all field plates, including trenched field plates, is technically incorrect. (Blanchard

Decl., ¶ 52). Therefore, it would be inappropriate to read limitations from the description of field plates in the Baliga Text into the language of the '947 patent claims.

Additionally, AOS's proposed construction requires that the substrate be silicon. There is no such requirement in the claims of the '947 patent, which never use the term "silicon," but rather use the phrases "switchable semiconductor power device," a "semiconductor device," and a "semiconductor structure." Likewise, the '947 patent is devoid of any teaching that requires the substrate to be made of silicon. A person of ordinary skill in the art would know that other types of material can be used for the substrate. (Blanchard Decl., ¶¶ 14, 53).

AOS's construction introduces unnecessary complications into the meaning of this claim language. The concept of breakdown voltage itself is highly complex itself. Adding the concept of depletion layers into the proposed construction only adds unnecessary complexity, especially since reading the concept of modifying the "depletion region" into the claim language does not help to distinguish a field plate from other structures present in a power semiconductor device. (Blanchard Decl., ¶ 51). In fact, any conductive structure in a power semiconductor device that is located near a junction can affect depletion layers near that junction. (Blanchard Decl., ¶ 51). So, adding this concept into the claim language would not distinguish a field plate from other conductive structures. (Blanchard Decl., ¶ 51). AOS's attempt to overly complicate and obscure the issues of claim scope in this case should be flatly rejected.

2. "a plurality of elongated inner runners extending in the same direction" ('497 patent, claim 6).

Fairchild's Proposed Construction	AOS's Proposed Construction
conductive structures formed in trenches extending in the same direction across the active area of the device	multiple substantially parallel gate trenches filled with a conductive material extending in one direction across the active transistor region

Fairchild proposed that "a plurality of elongated inner runners ..." be construed as "conductive structures formed in trenches extending in the same direction across the active area of the device." Fairchild's proposed construction is consistent with the '947 patent specification. The "inner runners" of claim 6 are referred to as "gate electrode," "conductive gate electrode," and "trenched gate

electrode” in the patent specification, and are labeled item 34 in Figure 1. (Jacobs Decl., Ex. D ('947 patent), at col.3, lines 27-31; col. 3, lines 39-45; col. 4, lines 2-7; col; 4, lines 16-32; col. 4, lines 36-46; col. 5, lines 15-19). The specification states that the gate electrodes are formed in a trench, labeled item 28 in Figure 1. (*Id.*, at col. 3, lines 25-31). The inner runners are also labeled as “trenches” in Figure 4B, which shows a top-down view of the invention. (*Id.*, at Fig. 4B). Figure 4B shows that the gate electrodes extend in the same direction across the active area of the device. (*Id.*). Fairchild’s proposed construction is consistent with this description in the ‘947 patent.

AOS’s proposed construction is similar to Fairchild’s, but it requires that the inner runners extend *only* in “*one* direction” across the active transistor region rather than the broader claim language that a plurality (two or more) of inner runners extend in the same direction. AOS’s proposed construction appears improperly intended to exclude certain common configurations of power semiconductor devices. Power semiconductor devices, such as power MOSFETs, can have a closed cell or an open cell configuration. (Blanchard Decl., ¶54). A device with a closed cell configuration generally includes transistor cells arranged in a grid, having MOSFET cells that are bordered on all sides by trench walls. (*Id.*) The cells often are square or hexagonal in shape. (*Id.*) A device with an open cell configuration, on the other hand, generally includes cells arranged in parallel stripes, having MOSFET cells that are bordered on only two sides by trench walls. (*Id.*) Devices with a closed cell configuration include inner runners that extend in more than one direction. (*Id.*) In the case of a square cell, one set of inner runners extends in one direction and another set of inner runners extends in a perpendicular direction, but the inner runners in each set extend in the same direction. Such devices are not excluded from the scope of the ‘947 patent claims. To the extent that AOS’s construction precludes such scope, it must be rejected.

3. "isolation trench" ('497 patent, claim 1).

Fairchild's Proposed Construction	AOS's Proposed Construction
an insulating structure, having a wall near the die edge, which electrically isolates the body region from the die edge	a valley filled with dielectric material surrounded by sidewalls in the periphery of a semiconductor substrate that can prevent leakage into the substrate

1 Fairchild proposes that the phrase “isolation trench” be construed as “an insulating structure,
2 having a wall near the die edge, which electrically isolates the body region from the die edge.” The
3 ‘947 patent specification states that “[a]n isolation trench 72, which may be formed at the same time
4 as the trench 28, includes the thermally grown oxide layer 30 and the deposited insulator 36,
5 preferably BPSG.” (Jacobs Decl., Ex. D (‘947 patent), at col. 4, lines 12-15). The specification also
6 states that “[t]he isolation trench 72 (not shown in FIG. 2) may also extend along the die edge 52.”
7 (*Id.*, at col. 4, lines 35-36). Consistent with this description on the specification, Fairchild’s proposed
8 construction states that the isolation trench have a wall near the die edge. A person of ordinary skill in
9 the art would know that the function of the isolation trench is to electrically isolate the body region of
10 the die from the die edge. (Blanchard Decl., ¶ 56). This function confirmed by Figure 1, which shows
11 the isolation trench 72 extending through the body region 22 and into the “N- upper layer 16” of the
12 “semiconductor layer 12,” thereby separating the portion of the body region 22 to the right of the
13 isolation trench from the die edge. (Jacobs Decl., Ex. D (‘947 patent), at Fig. 1).

14 AOS proposes that this claim language be construed as “a valley filled with dielectric material
15 surrounded by sidewalls in the periphery of a semiconductor substrate that can prevent leakage into
16 the substrate.” AOS’s proposed construction requires that a trench have two sidewalls, whereas
17 Fairchild’s proposed construction requires that it have only a single wall. AOS’s proposed
18 construction is inconsistent with the understanding of a person of ordinary skill in the art. (Blanchard
19 Decl., ¶¶ 55, 56). It is common in the field of semiconductor devices to manufacture multiple devices
20 on a single semiconductor wafer. (Blanchard Decl., ¶ 55). The devices are then separated from one
21 another by a process called “singulation,” which involves using a saw to mechanically cut separate
22 devices from the wafer. (*Id.*) It is also common to form isolation trenches between adjacent devices
23 on a wafer. (*Id.*) The singulation process often cuts through the isolation trenches between adjacent
24 devices, leaving one sidewall of the trench on one device and the other sidewall on the other device.
25 (*Id.*) A person of ordinary skill in the art would not consider the trench to have been destroyed by the
26 singulation process. (*Id.*) Rather, such a person would consider both devices to include an isolation
27 trench, each having a single sidewall. (*Id.*) Because AOS’s construction would exclude devices made
28 using this common manufacturing technique, it should be rejected on this basis alone. (*Id.*)

AOS's proposed construction also improperly states that the function performed by the isolation trench is to "prevent leakage into the substrate." This limiting language has no support in the intrinsic evidence and is unclear to a person of ordinary skill in the art. (Blanchard Decl., ¶ 56). Dr. Blanchard states that the isolation trench prevents leakage of electrical current between the source and the drain. (*Id.*) The language chosen by AOS, however, does not clearly convey this meaning. (*Id.*) Because AOS's proposed construction is overly narrow and ambiguous, it should be rejected on this additional basis.

V. CONCLUSION

Fairchild respectfully submits that its proposed constructions are supported by the claims, the patent specifications and the prosecution histories of the Fairchild patents. In addition, as explained by Dr. Blanchard, who is a nationally recognized power MOSFET expert, Fairchild's constructions are consistent with the understanding of a person of ordinary skill in the art. AOS's proposed constructions, however, find no support in the intrinsic evidence and improperly import unfounded limitations into the claims. For the reasons given and under the authorities cited, Fairchild respectfully requests that the Court adopt Fairchild's proposed constructions.

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Respectfully submitted,

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